Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 28, 1866.

Announcements by the Council.

Examinations, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

In addition to the prizes offered by the Society of Arts, the Worshipful Company of Coach and Coach Harness Makers offer a prize of £3 in Freehand Drawing, and a prize of £2 in Practical Mechanics, to the candidates who, *being employed in the coach-making trade*, obtain the highest number of marks, with a certificate, in those subjects respectively.

Proceedings of the Society.

CANTOR LECTURES.

"On the Synthesis and Production of Organic Substances and the Application which some of them Receive in Manufactures." By Dr. F. Crace Calvert, F.R.S., F.C.S., &c.

Lecture I.

Delivered on Friday, April 13th.

"On the Synthesis of Organic Substances."

The Council of the Society of Arts having again conferred upon me the honour of delivering a course of lectures on chemistry, I have deemed it advisable to lay before the members of this influential and eminently useful Society a branch of investigation and series of facts different entirely from those which I have examined on two former occasions. My first course had reference principally to the properties, the manufacture, and the application of certain classes of organic substances derived from or relating to the animal kingdom. I tried, at the same time, to impress upon the minds of my hearers the importance of studying chemistry in connection with those branches of manufactures; and I further attempted to effect this by drawing attention to the recent improvements which chemistry had introduced; and there are, no doubt, many more improvements that science will develop in process of time. My last year's course was conceived with a view of impressing on the minds of those fond of scientific pursuits the necessity of studying chemistry not only as a separate branch of learning, but in its obvious and intimate connections with nearly every other class of scientific investigation, such as physiology, geology, mineralogy, agriculture, natural philosophy, &c. The present course has been planned with the idea of giving an insight into that modern branch of science called organic chemistry; to show the valuable and interesting results arrived at by chemists in that department, and to impress upon my hearers the great advantages that society will derive from the progress of these researches, not only in a scientific point of view, but also as bearing upon manufactures and arts; for the manufacturers of the present day are not confined to the employment of mineral matters only in their productions, inasmuch as organic chemistry has placed at their disposal many useful substances which were quite unknown half-a-century ago, and no doubt many more will be brought to light by men of skill and research as their investigations proceed. This will, however, depend much on the progress of that science itself, which will show to chemists and manufacturers how to obtain from cheap and refuse matters substances which have a value; or, in other words, to produce artificially substances which now exist and are found in the organised kingdom, but the extraction of which is always costly and difficult, owing to the fact that the substance sought for is mixed with a variety of other substances which must be eliminated or destroyed before those substances, the properties of which are useful, can be made available. I shall, therefore, in this course of lectures, try to illustrate by facts the broad statement that science has enabled men already to produce artificially substances which may truly be called organic; and if science has already arrived at this triumphant result—I say "already," for organic chemistry barely dates fifty years back, and we all know that the first steps of a science are the most difficult and first principles require the greatest effort of the human mind to unravel — if in this short space of time we have succeeded in obtaining a great number of facts by which certain laws have been revealed to us, we have reason to expect and hope that the next fifty years will bring facts and results to light which shall be as profitable, and I may say as astounding, as those which have been discovered of late years by the means of chemistry, and which have guided manufacturers to many very important applications.

Thus the volatile products obtained from coals were first employed as an illuminating agent. Science and application have gradually brought that illuminating agent to a high state of perfection, and have shown the most economical way of employing it, and the best means of availing ourselves of its illuminating power without interfering with the health and lives of those by whom it is used. Thereby a cheap and effective illuminating agent has been secured to society. At the same time as these volatile and gaseous products are generated, water containing various substances is produced, and science having ascertained their nature, we find them converted into alums, sulphate of ammonia, and other commercial products extensively used in agriculture and in manufactures. Further, a dark, noisome, sticky product called tar is also extracted, which at first used to be the great hindrance to gas-light manufacture. This product having been examined and studied by chemists, a most valuable series of substances has been gradually extracted and applied to useful purposes. First of all we have pitch, used most extensively for making smooth, clean, and pleasant footpaths, promenades, and even roadways. Some of the oily products which pass off are used to preserve the sleepers on our railways, and other materials used in building which it is desirable to preserve from decay. Another solid substance, paraffin, is also obtained, which is now extensively used as an illuminating agent, and, when mixed with oils, as a lubricator. It has also of late been employed with marked success by Dr. Stenhouse as a substitute for caoutchouc, for preventing the permeation of damp or wet through fabrics. In addition to these, more volatile products are obtained, which were first applied to dissolve caoutchouc and other materials of the same class, and which, in their turn, were applied to a number of useful purposes. The chemical composition of these volatile products, having been further studied, means were devised for obtaining, by chemical transformation, a series of colours, rivalling in beauty, in cheapness, and in facility of application any dyes which were previously known to the world. Lastly, from coal tar or from coals a most powerful antiseptic agent is obtained, the value of which has been lately demonstrated in the cases of the cattle plague and the cholera. The properties of this substance have not yet been fully ascertained, but in course of time it will prove to be one of the most important yet discovered, owing to its powerful antiseptic properties, for we may consider most of the ailments and diseases of mankind as derived from the decomposition or decay of some of the tissues, and it therefore follows that in all diseases or decay whose source can be traced to the decomposition of organic matter, carbolic acid must undeniably be the most effective remedy.

It therefore follows that the most interesting branch of organic chemistry is comprised in the title of this course of lectures:—"The Synthesis and Production of Organic Substances by Artificial means."

The perfect knowledge which chemists have obtained by analysis of the relationship of composition which exists between organic substances, has enabled them of late years to produce artificially, or convert substances one into another, which they never could have succeeded in doing had they not had a clear insight into the composition and properties of substances under examination as compared with those they wished ultimately to reproduce.

It now devolves upon me to try to lay before you an outline of some of the methods which chemists have employed to ascertain the composition of an organic substance, and how they are able from that knowledge either to add certain elements to a substance so as to modify its composition and alter its properties, or to subtract certain elements and add instead of them certain others so as to produce new substances, which are identical with those which they want to re-produce or imitate. As it would be difficult for me in the course of an hour to lay before you the details of the system now employed by chemists to effect this end, I shall therefore try to give you an idea of that system generally by calling your attention to a new series of facts discovered by one of the most able of modern chemists, namely, the synthesis of organic substances, especially alluding to those which have reference to their reproduction by means of mineral elements; and before this lecture is over I hope you will be able to understand fully how that eminent chemist, M. Berthelot, has succeeded, by employing mineral matters, and by a series of successive chemical reactions, in producing substances which have hitherto been derived or are obtainable from the organic kingdom either by being extracted direct from their sources of production by a series of chemical manipulations, or which are the result of the destruction of organic substances under the influence of heat or decay.

The first example which I shall have the pleasure of calling your attention to is a gaseous compound called acetylene, or the richest carburetted hydrogen known, for it contains four atoms of carbon for two atoms of hydrogen. Although this product always exists, but in small proportions, in common coal gas, still M. Berthelot asserts—and no doubt with truth—that its presence increases materially the brilliancy of common coal gas, owing to the large proportion of carbon it contains, and which by floating in the flame radiates light and thereby increases its brilliancy. This substance is characterised by giving, with a solution of protochloride of copper dissolved in ammonia, a beautiful coppery precipitate, which is highly explosive. Acetylene, also, when mixed with chlorine, and the mixture is exposed to the action of light, or to any flame containing chemical rays, such as those produced by the combustion of magnesium or sulphuret of carbon, gives rise to violent explosions with the production of hydrochloric acid and a deposit of carbon. This fact I wish you to notice, as it will be, further on, a means of distinguishing this substance from another one, which is the chief illuminating agent of coal-gas, and called ethylene, or heavy carburetted hydrogen. This substance (acetylene) does not exist merely in coal gas. M. Berthelot has proved it to exist in a great number of instances, and to be a constant product of the slow combustion of most organic substances.

Further, this substance offers to us a peculiar interest, for it is the first ever produced by chemists by the direct union of carbon and hydrogen. Up to the time of this discovery, chemists were acquainted with a great number of carburetted hydrogens, either obtained naturally from the organic kingdom, such, for example, as otto of roses, the essences of lemon, bergamot, cloves, neroli, and the solid substances called caoutchouc, gutta-percha, as well as a great number of others obtained through the destructive distillation of organic matters, as well as coals, such as ethylene, amylene, caprolene, propylene, &c. M. Berthelot succeeded in obtaining acetylene (as I will show you at the end of this lecture) by passing through a glass globe a slow current of hydrogen gas, in which globe there were the two carbon points of an electrical battery in a state of incandescence, producing what is usually called the electrical light. Under this intense heat and electrical current, the hydrogen introduced by him combined with the carbon of the points and produced acetylene, which he collected by passing it through an ammoniacal solution of proto-chloride of copper, getting a coppery precipitate, or acetylide of copper, from which he easily isolated acetylene, thus proving to the chemical world the possibility of the artificial production of a carburetted hydrogen.

This discovery, which astonished the scientific world, was soon followed up by a series of most interesting facts. M. Berthelot having placed in a small flask, to which was attached a tube allowing the exit of any gas which might escape, some acetylide of copper, together with zinc and ammonia, and on heat being applied a chemical reaction ensued, by which two atoms of hydrogen were added to acetylene, converting it into ethylene or heavy curburetted hydrogen, also called olefiant gas, —a name which it derives from the fact that, about thirty years ago, some Dutch chemists having mixed this gas with chlorine and exposed the whole to diffused light, an oily fluid was produced called Dutch liquor, and the fluid having, as just stated, an oily appearance, gave rise to the gas being called olefiant. This gas is exceedingly interesting, owing to its being the chief illuminating element in common coal gas, and is characterised by burning with a bright flame, with no deposit of carbon, like acetylene, and when mixed with one equivalent of chlorine, and the mixture left to itself for some time, the chlorine unites with the olefiant gas, producing the oily fluid above referred to, called Dutch liquor; but when mixed with two volumes of chlorine, and a lighted taper brought in contact with them, hydrochloric acid is formed, and carbon is deposited; further, it is absorbed slowly by sulphuric acid, whose property, we shall see presently, M. Berthelot has most judiciously availed himself of to convert it into an organic substance. The olefiant gas, though existing in large quantities in common coal gas, cannot be isolated, owing to the numerous compounds with which it is mixed. Therefore it is necessary to adopt some chemical reaction to produce it in a pure state when it is desired to investigate its properties. To attain this end, one part of alcohol is mixed with three parts of vitriol or sulphuric acid, and on being applied each chemical equivalent of alcohol loses two equivalents of water; the remaining element of that alcohol, being olefiant gas, is liberated and can be examined. What gives interest to this chemical reaction is, that whilst you thus separate, under the influence of heat, alcohol into olefiant gas and water, you will, if we follow M. Berthelot's process, namely, of placing at the bottom a large glass globe, a small quantity of concentrated sulphuric acid, and filling the remaining portion of the globe with olefiant gas, keeping the same in a constant state of agitation, you will, after having imparted to the vessel some 40,000 or 50,000 rotatory motions, find that the olefiant gas has been absorbed by the vitriol; that it will have fixed two equivalents of water, and that it will have thus converted the olefiant gas into alcohol, which can be isolated by subsequent chemical manipulations. Therefore, from carbon and hydrogen, you will notice that we first produced acetylene; this substance we have converted into olefiant gas, which in its turn has been transformed into alcohol, which alcohol you can easily convert into ordinary ether, as I shall explain to you in my next lecture, or into acetic ether, spirit of nitre, or nitric ether, &c.; or you can also, by oxidising, convert it into a substance, which I shall also refer to, called aldehyde. To convert alcohol into ether, all you have to do is to remove from alcohol one chemical proportion of water, and the elements which remain, namely, one of olefiant gas and one of water, constitute ether.

We can still further pursue these interesting transformations. For if you add four proportions of oxygen to olefiant gas, or if you act upon alcohol, by means of platinum black, or, as I have lately discovered, by means of charcoal in presence of an excess of oxygen, you will convert alcohol into acetic acid, or vinegar. It therefore follows that, from carbon and hydrogen, mineral elements, a great number of organic substances can be produced. In fact, from acetylene the following series of compounds have been obtained:—

Acetylene can be transformed			($C^4 H^2$)
into			
Ethylene	,,	,,	($C^4 H^4$)
into			
Aldehyde	,,	,,	($C^4 H^4 O^2$)
into			
Acetic acid	,,	,,	($C^4 H^4 O^4$)
into			
Glycollic acid	,,	,,	($C^4 H^4 O^6$)
into			
Oxyglycollic acid		,,	($C^4 H^4 O^8$)
into			
Oxalic	,,	,,	($C^4 H^2 O^8$)

Allow me to call your attention to another series of facts, by which M. Berthelot has also demonstrated the possibility of producing organic substances from mineral elements. The starting-point of this series is a gas well known by name to all my hearers. It is called "firedamp," owing to the fact that it exists more or less in all coal-pits, and that when it is liberated in large quantities, and gets mixed with the atmosphere, it produces a most explosive mixture, the result of which is the destruction of thousands of lives in this country. This gas also bears the name of marsh-gas, from the circumstance that it is a constant product of the slow decay of organic matter. In fact, some twenty or thirty years ago, when a lecturer wished to illustrate the properties of this gas, called also light carburetted hydrogen, as compared with olefiant gas, which is called heavy carburetted hydrogen, his assistant had to proceed, as I have done myself, into marshy districts, and, by stirring up the mud, collect the few bubbles of gas that escaped from the swamp. This operation—to collect a gas mixed with impurities—which was far from agreeable when it had to be done in January or December, has been obviated through the progress of chemistry. Some twenty years since, Dumas found that when he heated in a retort a mixture of dry acetate of soda with baryta, a gas was generated which was marsh gas, resulting from the following reaction, the acetic acid of the acetate of soda having separated itself into carbonic acid, fixed by the baryta, the remaining element was marsh gas. But Berthelot has gone a step forward, and he has succeeded in producing fire-damp, or marsh-gas, direct from mineral elements. He has effected this interesting discovery by passing over some heated copper foils, placed in an earthenware tube, a mixture of two substances, namely, sulphuretted hydrogen and sulphuret of carbon. Under the influence of heat, the sulphur of the sulphuretted hydrogen and of the sulphuret of carbon unite with the copper, whilst the hydrogen of the sulphuretted hydrogen and the carbon of the sulphuret of carbon combine together to produce marsh gas.

This triumph of modern chemistry is most important, for if to marsh gas you proceed to add two proportions of water, it will be converted into methylated spirit, or wood naphtha, a substance now extensively mixed with alcohol to manufacture the product called "methylated spirit," so extensively employed in England at the present time in arts and manufactures, and which has been the means of removing the duty usually imposed by Government upon all alcoholic liquors capable of being used as a beverage, and enables English manufacturers to produce a variety of varnishes, &c., and to enter fairly into the field of competition with those countries in which alcohol may be considered a cheap article.

We may proceed a step further still, and convert this alcohol of wood, as it is often called, into an acid by a similar process as we succeeded just now in converting the alcohol of wine into acetic acid. Thus, if in a flat vessel is placed a small quantity of wood naphtha, and above it is suspended a watch-glass containing platinum black, or purified charcoal, and the whole confined in a bell jar, gradually the vapours arising from the wood naphtha come in contact with the platinum black and are converted into an acid called formic acid—an acid which can be extracted from the well-known insect the ant, or *Formica*. Therefore from carbon and hydrogen M. Berthelot has produced not only wood naphtha but formic acid, the product of an animal. Formic acid has become, like many other organic substances, a curiosity one day, a commercial product the next. It is now manufactured artificially in large quantities, owing to its successful application in the production of those beautiful tar colours, especially blue, to which we have already referred in this lecture. But the application of formic acid, I think, will not be limited; it will extend widely with time, not only because it reduces with great facility metallic salts, especially those of silver—and thus will, no doubt, become in time the means of silvering glass, instead of having to employ the present costly method.

Whilst dwelling on formic acid, let me call attention to a direct artificial mode of production of that substance, also from mineral elements, by a most skilful process devised by M. Berthelot. All persons must have noticed, on a winter's evening, on sitting before the hearth of a good fire, which has yielded up its gaseous matters under the form of flame and has left a red glowing mass, a fugitive blue flame, which has received the name of oxide of carbon—gas which is in fact always produced when oxygen is brought in contact with an excess of carbonaceous mass in a state of incandescence. This blue-burning gas, or oxide of carbon, which is highly poisonous, is the gas chosen by M. Berthelot to produce formic acid. To attain this end he pours into the bottom of a large glass vessel a strong solution of caustic lye of soda or potash, and fills up the vessel with oxide of carbon. After giving a rotatory motion to the glass vessel, the oxide of carbon is absorbed by the potash, and each two chemical proportions of oxide of carbon, in fixing one chemical proportion of water, is converted into formic acid, which unites with the potash to produce formiate of potash or soda. Besides these two interesting discoveries of the production of organic substances direct from mineral elements, M. Berthelot and several other chemists have produced organic acids from other hydro-carbons derived either from destructive distillation of coal or other organic substances. Thus the acid existing in valerian root has been generated from a hydro-carbon existing in petroleum, called amylene. Propylere has been converted into proprianic acid, napthaline into benzoic acid, &c. Further, hydro-carbons which are found existing in the products of the distillation of coal, as well as those existing in petroleum, can be produced artificially by chemical manipulation, and these hydro-carbons are in their turn the centre of a great number of chemical substances, which chemists have succeeded in producing, either adding elements to them, or substituting certain quantities of their hydrogen by other elements, thus giving rise to a new series of products, and thereby a great variety of organic substances.

It will, therefore, be easy to understand how important it is for chemists to be able to produce artificially from one carburetted hydrogen another carburetted hydrogen, and this M. Berthelot has been most successful in accomplishing. By heating, at a high temperature, light carburetted hydrogen he has succeeded in producing artificially benzine, a substance now so extensively employed, as I have told you in some of my former lectures, in producing most of the tar colours now used in trade. He has also obtained napthaline by the same means; and you will perceive by the following tables that it is simply necessary to add to a carburetted hydrogen, say equivalent proportions of carbon and hydrogen, to convert it by successive addition into a series of hydro-carbons, susceptible in their turn, by means of oxidisation and other chemical action, of being converted into acids and other products:—

Ethylene	$C^4 \; H^4$
Propylene	$C^6 \; H^6$
Butylene	$C^8 \; H^8$
Amylene	$C^{10} \; H^{10}$
Caproylene	$C^{12} \; H^{12}$
Œnonthylene	$C^{14} \; H^{14}$
Caprylene	$C^{16} \; H^{16}$
Ethnlene	$C^{32} \; H^{32}$
Cerylene	$C^{32} \; H^{32}$
Melissene	$C^{60} \; H^{60}$
Or,	
Marsh gas or formyl	$C^2 \; H^4$
Hydrate of acetyl..............	$C^4 \; H^6$
„ propnonyl	$C^6 \; H^8$
„ butyl	$C^8 \; H^{10}$
„ ralyl	$C^{10} \; H^{12}$

That eminent chemist, Dr. Hoffman, has succeeded in producing of late years a great variety of organic substances, by substituting for the hydrogen which enters into the composition of ammonia or hartshorn (composed of three atoms of hydrogen and one atom of nitrogen), some of the above carburetted hydrogens, thus giving rise to a most interesting series of products, many of which in time will doubtless become extensively employed in arts and manufactures. I cannot leave this part of my subject without mentioning the names of Dr. Frankland, Professor Williamson, Messrs. Duppa, Wanklyn, Perkins, and Foster, among our English chemists, who have much contributed to the progress of organic chemistry by their successful researches in reproducing artificially organic substances, on some of which I shall have the pleasure of dwelling fully during this course of lectures. There are other discoveries not less interesting, but which are in themselves too abstruse, and which involve too many scientific data to justify me in bringing them before you in addresses intended for a general audience, and not especially for a particular branch of professional students.

The lecture was concluded by illustrations with apparatus, giving an outline of the methods followed by chemists to determine the elementary composition of an organic substance. Without entering here into all the details of manipulation necessary, and a description of the apparatus used for ascertaining these compositions, it may be stated that the object of these operations was to determine the exact quantity of carbon (charcoal), and the exact proportion of hydrogen gas which exist in 100 parts of an organic substance. This being determined, the figure necessary to reconstitute the 100 parts of the organic substance employed is represented by oxygen, and it is easy to calculate, by employing chemical equivalents, what is the formula which that organic substance should have. To determine the amount of carbon and hydrogen in the substance, it is placed in a tube, and after being carried to a red heat it is subjected to the action of oxygen, either employed as a gas or in contact with a substance such as oxide of copper or chromate of lead, which yield oxygen with facility. The result is that the carbon is converted into carbonic acid, which is absorbed by alkali, and its amount accurately determined, and the hydrogen of the organic substances is converted into water, which is condensed by means of oil of vitriol, and thus its proportions are accurately ascertained. With these data it is easy to determine the number of atoms of hydrogen, carbon, or oxygen which exist in organic substances. As to organic substances which contain nitrogen, the porportion of this gas in 100 parts of the substance submitted to elementary analysis is determined either by collecting it as a gas, and from its volume calculating the amount in the substance, or it is converted into ammonia, which, in its turn, is absorbed by sulphuric acid, and its amount also accurately ascertained. By these methods the amount of nitrogen in the organic substance is known.

NEW PRIZES AT THE PARIS EXHIBITION.

A correspondent addresses the *Times*, asking for an explanation of these prizes, as follows:—

SIR,—Some new and startling prizes of a munificent kind are offered to the world at large at the Paris Exhibition of next year. Besides one *grand prix* of four thousand pounds sterling, there are ten lesser prizes of four hundred pounds each. They are to be given, using the words of the proclamation of the Imperial Commission, "to persons, establishments, or localities, which, by a special organization or special institutions, have developed a spirit of harmony among all those co-operating in the same work, and have provided for the material, moral, and intellectual well-being of the workmen." Can you help me and others interested to some specimens of the kind of candidates most suitable for these prizes? I confess myself rather puzzled. Would Saltaire, near Bradford, that new city, with its complete sanitary arrangements, its schools, chapels, clubs, halls, and perfect factory organization, be a proper recipient? or the London and North Western Railway, with its staff of old servants, churches, schools, workshops, and army of labourers? The co-operative store at Rochdale would seem eligible, but how can it be said to have promoted the intellectual well-being of the workmen? Could the Rev. F. D. Maurice, Working Men's College, be a candidate? Would a well worked parish be accepted? What is meant by a special institution? A hospital, club, museum, or what? Pray enlighten candidates if you can; if not, try and persuade your contemporary, the *Moniteur*, to do so.—I am, your obedient servant, A PUZZLED READER.

20th Sept., 1866.

[It certainly is not clear what is to be the guiding idea,—whether harmony among workmen co-operating, or this combined with morality and intellect. Many cases might be instanced where the object of the Institution has been the intellectual improvement of workmen which has induced morality and harmony. Members are invited to discuss the subject in the *Journal*. Candidates for the prizes must send in their claims to H.M. Commissioners before 31st October next.—ED. *J.S.A.*]

EXTENSION OF TEA CULTIVATION.

The following article is taken from the *Produce Markets' Review*:—"The Darwinian theory, in the attempt to explain some of Nature's mysterious laws, refers their solution to the natural selection of species, and represents the various families of animal creation as engaged in one life-long—we might almost say, perpetual

—struggle for existence. The legend of Ormuzd and Ahriman, in Persian mythology, and of Vishnu, the creator, and Seeva the destroyer, in the mythology of the Hindoos, is typical, no doubt, of the two great agencies of nature, the production of life and its destruction. But it is not only here that we find proofs of this innate antagonism; we see evidence of its existence in the vegetable kingdom. With less of poetical sentiment, but more practical directness, we recognise this struggle as one between production and consumption. To determine in what way, and to what extent, these two important elements act and re-act upon each other is a question affecting perhaps more than any other the welfare of the human race; and a consideration of some of the points bearing upon the question, though in the present instance having a more immediate reference to tea, may be regarded as not out of place in a journal professing to deal exclusively with articles of produce. At first sight it would appear as if no reliable relation between consumption and production could be established, from which conclusions might be deduced; for whilst the power of consumption might be presumed to be almost limitless, bounded in fact only by the extent to which population itself may be increased, it is as confidently believed that production could only be carried on under narrower limits, restricted by considerations of temperature, soil, and human labour. It is, however, easy to check consumption by prices, and statesmen, when they thought that if an impost upon any article of prime necessity were doubled, the revenue accruing from this impost must also be doubled, were arguing upon a fallacy. The possibility of a decrease in the consuming power was tacitly disregarded by them, and it is only within a comparatively recent period that the magnitude of the error underlying the assumption has been comprehended to its full extent, and the superior productiveness of low duties admitted as a fact without reserve or qualification. And perhaps even at the present day these antiquated and fallacious maxims might hold good had it not been for the aid brought to bear upon the subject by statistical science, a science without which no study can be deemed profitable, no theory complete. Whilst opinions so erroneous prevailed on the subject of consumption, it was not likely that the views generally held on production should be more enlightened; and we find accordingly the most timid, and perhaps to some minds even alarmist, views on the subject of Nature's productive powers. Of such a character was the opinion recently promulgated, as to the probable scarcity of coal within our island; and such too are the views put forward from time to time with regard to our future supply of tea, in all sincerity doubtless, but with a somewhat partial and exaggerated estimate of things as seen from one point of view exclusively. That increasing consumption brings with it an increasing production is surely as much a familiar fact as that an extended cultivation, by introducing competition, and so lowering prices, will encourage increased consumption. But to assert that consumption is overtaking production, or, what is the same thing, that production will fall short of the demand made upon it, is very much like saying that the hinder wheels of a carriage must before long overtake the front wheels. The fact is, that these two agencies—consumption and production—are so inextricably interwoven in their action upon each other that it is impossible to estimate with exactness the precise value of the one without considering it in its relation to the other. As contrasted with animals of a lower organism, man is distinguished by his ability to live and thrive under the most opposite conditions of climate and temperature, from the poles to the equator; and this universality of existence is shared to almost the same extent by those plants and herbs which are more immediately necessary to his subsistence, such as corn, the potato, &c. Before long we may even be in a position to include tea in this list, as its cultivation is now being attempted in all quarters of the globe, in Asia, Australia, Africa, and America, and it has also been attempted in Southern Europe, with results which gave strong hope of its profitable introduction into Spain and Italy. We propose to show that China is not the only place from which we can obtain our tea supplies. We do not mean to say that tea could be immediately produced in marketable quantities wherever the climate is suitable; but that, in the course of time, if prices were sufficiently tempting, we might become independent of China and Japan. Putting aside India, which could supply not only England, but the whole world with tea, we turn to other parts of the world where, as yet, tea cultivation is only an experiment. "The important experiment of testing the climate and soil of South Australia, as regards their suitability for the China tea plant," says the *Melbourne Register*, "is about to be made on a somewhat extensive scale. The Government have agreed to pay Mr. Sterndale, who recently brought a quantity of tea seed to the colony, the sum of £50 for one hundredweight of the seed, and they have instructed Dr. Schomburgh, superintendent of the Botanic Garden, to sow and distribute it, with the view of fairly testing its adaptability to this country. Accordingly, it has been determined by the governors of the Botanic Garden that one-half of the quantity shall be sown in the grounds of that establishment, and that the other half shall be distributed in various parts of the colony."

In South Africa, the experiment of tea cultivation seems to have been attended with the most complete success. "In another column," says the *Natal Mercury* of July 3rd, 1866, "will be found an advertisement offering for sale the first tea trees imported into the colony. That soil or climate is no bar to the successful production of tea in Natal these trees will abundantly prove. They were imported about ten years ago, and were then small plants, bearing from ten to fifteen leaves each, and since then have grown like native bushes, until they are now thick shrubs from six to eight feet high, and as much through. A small sample of tea made from these plants, with unsuitable appliances, was sent with the Natal collection to the London Exhibition in 1862, and obtained an award of commendation from the jurors. We should be glad to see this enterprise taken up with energy, now that an opening presents itself, and the article of tea added to the staple products of the colony."

And fifteen years ago an American author, Francis Bonynge, descanting on the future wealth of the United States, and the possibility of a decline in the cotton trade, proposed the substitution of tea, coffee, or indigo, in the place of the cotton plant. After an elaborate comparison between China and America, considered with respect to climate, soil, and the price of labour, Mr. Bonynge comes to the conclusion, in which we fully concur, that in the event of any considerable reduction taking place in the price of tea, Europe, or we might say England, could consume five or six hundred millions lbs. of tea as readily as the one hundred millions, the quantity which represents our annual consumption. Mr. Bonynge goes on to prove that its production in America could profitably carried on at as low a sum as 2⅔ to 3⅗ cents per lb.—an opinion which we are not prepared to endorse so unhesitatingly. It is but fair to Mr. Bonynge to admit that his remarks upon the suitability of America for the cultivation of the tea plant are curiously corroborated by one of the most eminent of modern botanists, Professor de Candolle, from whose address, delivered this year at the Horticultural Exhibition at Kensington, we quote the following remarks:—

"Botanical geography shows in the clearest manner the analogy between the vegetation and climate of certain regions; and, just as a celebrated geologist was able to say, beforehand, there was gold in such a part of New Holland, and gold was found there, so could the botanist say with equal certainty that the olive tree and the cork oak would succeed in Australia;

that the eastern and temperate region of the United States was favourable to the growth of Chinese plants, more particularly to that of tea; and that that part of America included between San Francisco and the Oregon territory would, one day, supply wines as varied and as excellent as those European ones produced between Portugal and the Rhine. It is a singular fact that the two principal beverages of the civilised world, wine and tea, which produce similar stimulating effects, and which to a certain extent are the substitutes one for the other in different countries, present also in the mode of cultivating them the most marked resemblances and differences. The vine and the tea plant succeed best on stony, barren hill-sides. The two shrubs require a temperature climate, but the vine requires heat, and no rain during summer, whilst the tea-plant requires rain, and but little summer heat; the result of which is that these two species are almost geographically incompatible. Vine-growing countries will never produce tea, and *vice versâ*." The experiment which Mr. Bonynge so warmly recommended had previously been tried with the most encouraging prospects of success by Dr. Junius Smith, in the year 1849, in South Carolina. Upwards of 500 plants of from five to seven years' growth were imported from China and India; and it is interesting to know that the general characteristics of the plant remain unchanged by the new climate and soil, and that the "leaf puts out at the same period of the year that it does in China." (Simmonds' *Commercial Products*, p. 96). Dr. Smith estimated that he could produce tea in America at as low a price as 5d. per lb., whilst the average cost in China at the ship's side is at least 10d. per lb. This excessive cost, that is, apparently excessive, when contrasted with Dr. Smith's moderate estimate, arises almost wholly from the expensive nature of the means of transport, and the want of proper machinery. "In America," says Simmonds, the authority just quoted, "the beating and rolling of the leaves, one-half of the labour, could be done by the simplest machinery, whilst the fuel could be economised by means of flues." It has been suggested, too, with great plausibility, that it might be cultivated with success in California, where there are already so many Chinese on the spot, whose labour and experience would be thus utilized, when the gold hunting mania had subsided. "The climate, soil, and surface of California," says Simmonds, "exactly answer the requirements for the growth of this plant. The time may yet come when the vast ranges of hills that traverse this state shall present terraces of tea gardens, cultivated by the laborious Chinese, and adding millions to the value of its products." We may add, that we heard some time since that tea was successfully grown in Florida. It also appears that the cultivation has been carried on in Brazil since the beginning of the century, and that the industry still exists, though on a small scale. The Dutch seem to have been the first to break in upon the Chinese monopoly of tea cultivation, by introducing the plant into Java in the year 1828; and in the year 1848 as much as 1,000,000 lbs. was shipped from that island. The tea plant grows also in Cochin China, Tonquin, and some of the mountainous parts of Burmah, but the quality is generally considered inferior.

The Indian crop may now be roughly reckoned at 4,000,000 lbs., but official papers show that the tea land on the slopes of the Himalayas alone is capable of producing 600,000,000 lbs. of tea annually. By way of an appropriate pendent to these remarks we turn to Mr. Henry Waterfield's able report on the moral and material progress of India during the year 1864-5, and find the following remarks on the subject of tea cultivation in India:—"Considerable difficulty was experienced in obtaining information as to the progress of tea cultivation in Assam, owing to the reticence of the planters. According to the most accurate returns which could be procured, the extent of land under cultivation increased by 12,838 acres, and the out-turn of tea by 188,217 lbs. The numbers of proprietors was three hundred and sixty-six, of whom one hundred and forty-nine were natives, but several of the latter were merely owners of grants, with nominal clearances on them. The estimated produce in 1865, if realized, will give, at the price obtained in England, receipts to the value of £300,000. The area taken up for tea planting in Assam is 516,475 acres, of which about a twelfth has been brought under cultivation. There seems ground for apprehension that, unless great activity is shown in importing labourers, some of the lands already cleared will run again into jungle, as the available number of workmen in the province does not give one person for each acre that is cultivated. There is, however, no indication of a decrease in the popularity of tea planting; and though not perhaps as profitable as it was to the first owners who prepared the estates, and sold them at an enormous advance on their outlay, it promised to afford a safe and reasonable profit to all those who have not paid an excessive price for their gardens.

"In Sylhet there was a very slight increase in the area cultivated, but the out-turn of tea exceeded that of the previous year by nearly 25,000 lbs. The soil of Chota Nagpore is considered to be as well suited for tea as that of Assam, but the climate is rather against a favourable development of the plant, though the results already obtained are sufficient to warrant a fair hope of success. The cultivation of coffee was also commenced in that division. The quality of the tea raised by the Rhamghur Company in the Hazareebagh district is pronounced to be excellent. The number of labourers embarked for the tea plantations in Assam, Cachar, and Sylhet, was 28,282. The Act which was passed by the Bengal Council to regulate their contracts has been mentioned in another part of this report. Great care and consideration are now shown to the coolies by contractors; and, from the few complaints which have been received, it is believed that they are well treated by the recruiters also.

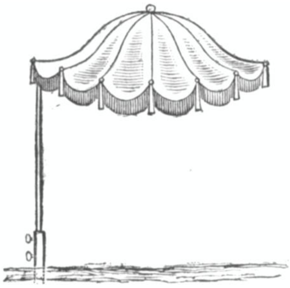
"The yield of tea at the government plantations in the North-Western Provinces was 54,527 lbs., much of which went to the Umritsur market, or was exported to Affghanistan and Cashmere. The cultivation of tea has been commenced in Oude by some European gentlemen, who have purchased waste lands, and laid out large sums of money in their reclamation. There is hardly any available waste land suitable for tea in the Muree hills, and the only way by which its cultivation in that part of the Punjaub can be secured is by inducing the peasantry to undertake it, for which purpose many thousands of plants were distributed from the government plantations to the adjacent villages. The cultivation in the Kangra valley being now placed on a sound basis, the government has determined to withdraw from the undertaking, and the plantations at Holta will be sold by auction. Upwards of seventy tons of seeds, and 1,769,033 seedlings, were distributed gratis to planters during the year. In the Madras hills several acres of ground have been planted with the Chinese and Assam varieties of tea, with the view of supplying seed to planters." In this last statement Mr. Waterfield seems hardly to have realized the extent to which tea cultivation is being tried in Southern India. The omission from the report of Ceylon, where tea is also being tried with fair hopes of success, is probably due to the fact that Ceylon is technically a crown colony, and is thus excluded from an Indian report, as India is under a different branch of the Government. When these various facts are taken into consideration it will be seen that there is little chance of production being overtaken by consumption, and that the question of the introduction of tea cultivation over the greater part of the semi-temperate portion of the globe is simply one of price and of time.

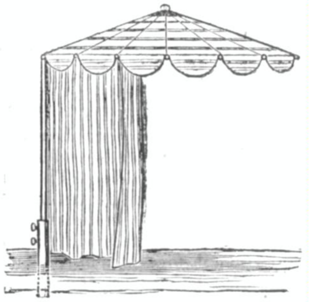
It would appear, in short, as if the tea-plant, like the potato, on account of its being necessary to man as an article of food, were capable of being cultivated almost anywhere. Little fear, then, need be felt on the score of its possible scarcity in one particular country. Indeed, at present, the quantity that we derive from sources other than China itself amounts to no less than 14,000,000 lbs., about 12½ per cent., or one-eighth of the total exports from China. When it is remembered that the sources out of China, from which these supplies are drawn are entirely new, it will, we think, be conceded that our arguments on the subject of tea extension are not chimerical, but founded on fact.

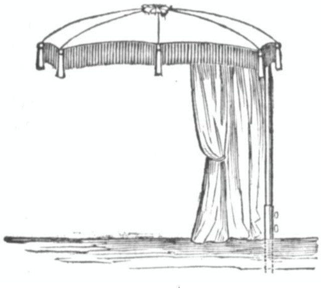
SUN SHADE FOR GARDEN SEATS.

The following is a description of "The sun shade for garden seats," for which a prize of £3, given by the Society of Arts, was awarded to Mr. T. L. Scowan, at the International Horticultural Congress* :—

This canopy, or sun shade, for garden seats, is constructed rather upon the principal of the fin of a fish, or a pair of wings, horizontally expanded, with the two front edges brought together. This horizontal action enables the maker to give a round, square, oblong, or any other shape required, and to place the stem at any part from centre to edge, the latter being a very great advantage where required, as it leaves the whole of the centre of the canopy unobstructed. This canopy, with the addition of a curtain, forms a most complete sun shade, which can be erected or taken down in one minute.







In erecting the canopy a tubular spike is first driven into the ground, and the stem inserted therein, which, acting telescopically, can be raised or lowered to height required. The canopy is then placed on the stem and opened. The facility with which this canopy can be expanded, or collapsed and taken down, offers the opportunity of keeping it clean and free from insects.

These canopies are also extensively used, made in suitable material with proper fittings, upon open carriages, such as wagonettes, park phaetons, perambulators, &c.

Fine Arts.

Burlington House.—The London University and the Royal Academy lose no time in taking advantage of the last decision of the House of Commons. Already the space of ground at the back of Burlington-house is apportioned between the two claimants, and the London University has commenced active operations. Trees are felled, and the ground is levelled for the foundations. The moiety of Burlington-gardens which falls to the lot of the University will give a spacious, and yet fortunately, as to traffic, a quiet and secluded frontage towards Cork-street and Burlington-street. Mr. Pennethorne's designs for the building, with the exception of some final details, are now prepared. He had, in the first instance, presented to Lord John Manners a classic façade, but, at the request of the First Commissioner of Public Works, the design ultimately adopted was made. The style, which finds affinity to that of buildings in the North of Italy, is transitional, not wholly divorced from the classic on the one hand, and yet holding still closer affinity to Gothic forms. The elevation consists of a centre and two wings; in the latter are two spacious lecture-theatres; the examination-rooms, &c., occupy the main body; the entire ground plan covers an area of about 220 feet by 150 feet. The treatment, though allied to Italian Gothic, is yet independent and individual: no one model in Venice or Lombardy has been implicitly followed: on the contrary, the whole design has been adapted to the exigencies of climate, demands of utility, and the resources of local materials. For the marble architecture of Italy will be substituted a stone architecture, which may be more in keeping with immediate surroundings, and the cheaper and ruder material will be so employed as to secure polychromatic display. The adopted Gothic, too, admits of varied sky outline: a steep roof, and a couple of lofty campanile will present a bold profile. The parliamentary estimate is £65,000, of which £20,000 was voted last session as a first instalment. The remaining moiety of the gardens, that adjoining Burlington-house, has not yet undergone any marked change under the hands of its present owners, the Royal Academicians. The volunteer drill shed, as also the more venerable trees, still stand undisturbed tenants of the soil. It is understood, however, that the Academy will not be slow to avail itself of the advantages offered by the present Government. One of the body, Mr. Sidney Smirke, is entrusted with the making of plans for the new galleries, in which, in the course of two years, it is hoped the Academy Exhibition may be held. To this portion of the entire scheme, which vitally affects the future of the Academy, we shall revert when the plans are finally matured. Under present arrangements, the façade of Burlington-house, which the Institute of Architects and their President, Mr. Beresford Hope, made efforts to save, will remain intact. The effective Doric or Palladian colonnade, however, that rounds off the area on the side next Piccadilly, and which some deem the best part of the architectural composition of the celebrated amateur, the Earl of Burlington, appears still in danger. It will doubtless be necessary to widen the present entrance from Piccadilly, which, though just sufficient to admit numerous carriages on the receptions of the President of the Royal Society, will not be spacious enough for the shilling visitors to the Academy Exhibition. The inspection of the entire ground gives reason to hope that the present colonnades, and any further projected buildings, may be so thrown back as to gain the needed width of entrance and at the same time preserve the symmetry of the existing architectural composition. These several works are committed to the divided care of Mr. Pennethorne, Mr. Sidney Smirke, and Messrs. Banks and Barry. It will be the duty of the Commissioner of Works to see that the several designs, new and old, shall clash together as little as possible.

---

* See *Journal*, p. 577, Class 231 D.

Manufactures.

◆

Portuguese Alcohol.—A considerable quantity of spirits, used in the preparation of inferior wines, is manufactured in Portugal from figs, which are largely grown in the provinces of Algeria and Alentigo. Spirit of an inferior quality, used only in the preparation of liqueurs, is also manufactured in large quantities from a small fruit called medronhos (the berry of the arbutus), which is extensively grown in the country.

Cotton Manufactures.—The total declared value of the cotton manufactures exported last year, exclusive of yarn, was close upon 47 millions sterling, being one and a quarter million in excess of 1864, and nearly seven and a half millions over that of 1863. The exports of 1865 were thus made up:—

Cotton yarn value	£10,351,049
Piece goods	44,860,239
Lace and patent net	462,263
Cotton hosiery and small wares	827,856
Thread	753,438
Total	57,254,845

This year shows even still greater progress, the cotton manufactures shipped in the first six months being of the value of £30,418,404, and the yarn £6,680,747.

Commerce.

◆

Railways and Communication in Russia.—Railways have been for some years the object of special attention to the Russian government. The surveys of projected lines, as well as the works of those in execution, are receiving at the present time a fresh impulse. St. Petersburg, Moscow, and Warsaw are already in communication with each other; and Eastern Prussia and Berlin may be reached by Gumbinnen and Thorn. More towards the south the Russian lines join those of Cracovia, leading to the two Prussian Silesias; and before long the southern line, which at present is opened from Odessa to Balta, will communicate with Bessarabia, a province bordering on the Roumanian principalities, and communicating with the Lemberg railway in Galicia. Another central line, running from north to south, is intended to unite the capital, Moscow, Ozel, Koursk, Kharkov, Nicolaieff, Sebastopol, and Taganrog, and to put the Gulf of Finland into communication with the Crimea. The southern part of this line is intended in the east to fulfil the same purpose as that of the Odessa-Balta in the west, viz., that of bringing to the two ports of exportation, Taganrog and Odessa, the wheat of Ukraine, of Pultava, of Ekaterinoslav, of Kherson, and of Podolia. A branch from the Balta line would no doubt run north-east towards the central part of the Ural. In a few weeks the trunk lying between Moscow and Serpoukhoff will be opened for traffic, and as far as Koursk next year. Supposing she could not, without solution of continuity, carry her products from the Baltic to the Black Sea, she has railways that lead or will lead within a little, to the frontiers of all her neighbours from the Pruth to Niemen. Other interior and transversal lines, such as those of Riazan, of Nijni Novogorod, are of great utility, but none more worthy of interest than the two following, intended to form a double communication between the Caspian and the Black Seas. The first of these lines, which is but twenty leagues in length, is in full work. It begins at Tzaritzin, an important town situated on the right bank of the Volga, which falls into the Caspian, and finishes at Kalatcheff, a town on the left bank of the Don, which falls into the Sea of Azof. The second of these lines is due to the energy of the Grand Duke Michael, Governor-General of the Caucasus. A line of railway is likewise intended to unite the port of Poti on the Black Sea with that of Bakon, on the Caspian Sea, passing by Koutaïs and Tiflis; the line follows principally the valleys of the Rion and the Kour. For the last two years six thousand soldiers have been employed under the direction of Mr. Bailly, an English engineer. The port of Poti is now the site of important works, which will make it the principal port of the Black Sea in these parts. Besides this, the organisation of a direct service of steamboats with Constantinople, and the establishment of a good carriage road between Tiflis and Tauris is in contemplation. Merchandise from Persia and Central Asia will probably follow the Russian lines, and it may be foreseen that the Transcaucasian line will almost completely absorb in these parts the traffic between Europe and Asia.

Preservation of Fruit by Means of Ice.—An American merchant, who has undertaken the importation of Boston ice to the Cape, proposes the importation of fresh grapes from that colony to Europe, preserved by means of ice. A trial of this mode of preservation has already been made at Cape Town, with very good results. A certain quantity of grapes and apricots were surrounded with ice, and were perfectly preserved for six weeks. If the trial answers, a great success seems to be reserved for this undertaking. For instance, at the Cape the seasons are quite opposite to those of England and France, consequently the grape which ripens at the Cape towards the end of January, would arrive in England or France about thirty days after, that is to say during the winter. The Cape grapes are savoury, sweet, and large, they would therefore be much relished in Europe. They have, besides, the great advantage of being cheap. The exporter would be able to procure them, in buying on a large scale from the vineyards, at the price of one penny the pound, and, in delivering them in London at a shilling, would clear a very satisfactory profit. Admitting their being retailed in London at 1s. 3d., and at Paris at 1s. 8d. or 2s., it will be seen that this is a very moderate price for obtaining fresh and excellent grapes. This enterprise in other quarters, thanks to the American ice trade, which tends to expand more and more, might start the idea of similar industries in all parts of the world, thus permitting Northern Europe, and especially England and France, to receive and taste all the delicious fruits with which tropical countries abound.

Railway Enterprise in Italy.—In Italy there will be shortly working 5,235 kilometres, or about 3,271 English miles, of railway. Besides the completion of the Venetian lines, which will reach in a few days as far as the borders of Illyria, and 302 kilometres recently finished in the valley of the Tiber and the Arus, that is to say, Ancona, Orte, and Montevacchi-Torricella, within two months there will be opened to the public 317 kilometres of new line, namely, those of Pavia and Cremona, Brescia, Messina, and Catania, the completion of the Aretuna and Ferrara and Rovigo, which includes the temporary bridge over the Po. Within a month Florence will be directly united by railway on the one side with Rome and Naples, and on the other with Venetia and the Frioul; the working of the Italian railways will then begin to acquire a systematic character. They will have for basis two great lines without interruption; the one, 1,080 kilometres in extent, will traverse the peninsula from Udino to Naples, by way of Padua, Ferrara, Podetta, Arezzo, Foligno, and Rome, and will cross at the Bologna station the other line, 1,200 kilometres in length, and which already unites Susa with Lecce, by way of Turin, Alexandria, Piacenza, Modena, Rimini, Ancona, Bari, and Brindisi. At the same period it is expected that an important modification in the railway tariff will be adopted. The subject is already under consideration, and a long report has been drawn up.

Caoutchouc and Gutta Percha.—The imports of india-rubber have kept pretty steady in the last few years. In 1863, 65,649 cwts. were imported; in 1864 and 1865, about 71,000 cwts.; and in the past six months of this year 30,000 cwts. have been received. Of gutta percha the imports are less steady, amounting to 21,655 cwts. in 1863; 35,646 in 1864; 29,077 in 1865; and only 8,019 cwts. in the first six months of 1866.

Bullion.—In 1863 we imported gold of the value of a little over 19 millions; in 1864, nearly 17 millions; in 1865, only 14½ millions; and in the first six months this year nearly 12½ millions. Against these the exports were—1863, 15¼ millions; 1864, 13¼; 1865, 8½; 1866, first six months, 7⅓ millions. Of silver, in 1863, we imported nearly 11 millions; in 1864, about the same; in 1865, under seven millions; and in the first six months of this year, four millions. The shipments of silver were, in 1863, 11¼ millions; 1864, under 10 millions; 1865, 6¾; 1866, to June, 3¾ millions.

Italian Commerce.—The imports of wine into Italy seem to nearly balance the exports, so that the wine-producing industry of Italy does not appear likely to sustain a competition with the corresponding industry of France or Spain. Italy possesses at the same time the elements of a great vinicultural prosperity. What is wanted is a diffusion of good methods of culture and manufacture, and a classification of the products of the vineyards of the country, besides a more general union of the vine-growers in a common interest. The imports of wine in 1854 to Italy amounted to 28 millions of litres, while the exports were 30 millions. In the first nine months of 1865 the imports were 17 million litres, and the exports 17¼ million litres. Silk, which is one of the lucrative branches of the national industry of Italy, has been afflicted in its production during the past twelve years by disease in the silkworms and in mulberry trees. The crop of silk has diminished to 2,000 tons annually. Attempts have been made in Italy, as in France, to remedy the evil by considerable purchases of foreign seed, but of late years the results have been generally unfavourable. In 1866, however, worms of Japan crossed with those of Italy have furnished some good cocoons; the indigenous worms have also succeeded passably, notwithstanding the adverse influence of a wet and cold May.

Baden Hops.—The hop trade in Baden is of great extent and importance. It is carried on in Manheim by 20 firms, and the business amounts to about 20,000 cwt. annually, of the value of £300,000. About half this amount goes to Bavaria, Bohemia, France, England, Spain, and Portugal, and the other half is consumed in the country and in the other Zollverein States. The three first-mentioned countries import the best kind of Baden hops, and England is the chief consumer of the more ordinary sorts. The large hop trade to Bavaria and Bohemia is the result of the improvement in the cultivation of hops in Baden, which has taken place of late years. Baden produces in good years a crop of 23,000 cwt. The price of hops in Baden at the time of the greatest demand was 100 to 140 florins per centner (about £15 to £21 per cwt.)

Colonies.

West Australia.—Mr. McRae's report of his exploratory trip from Roebuck Bay to the Fitzroy River has been published, and fully bears out the rumours previously existing as to the fine country seen. About 150 miles from the bay a fine river, named the Logue, was running east, which, after being joined by another from the south-west, appeared to lose itself in extensive marshy flats bordering a large open sheet of water, stretching north-easterly as far as the eye could reach. Nine miles further east, where the Fitzroy was struck, it was there 150 yards wide, and a current of two miles per hour. They passed over twelve or thirteen miles of country along the western bank of the river, crossing one tributary from the south and a large branch from east-south-east. The country for two miles was covered with grass six feet high; and for seven miles consisted of plains insersected by swamps and deep clay pans, and beautifully grassed, a portion being lightly timbered. On the return the country on the Logue was further examined; much of it was open plains, and some lightly timbered, a light clay soil well grassed; the main branch of the river came from the north-west, the other branch from the south-west. Mr. McRae says the country seen on and about the Fitzroy is the best he has seen on the north-west coast, and possesses all the advantages of a good sheep country.

Victoria.—The total income for the year amounts to £2,949,921, against £2,860,954 for the earlier half-year, showing an increase of £88,967. These totals show that, notwithstanding the political troubles, the revenues of the colony are as elastic as ever. There is a decrease of £2,691 exhibited in the customs for the year. This is a large sum, and seems to be generally distributed over articles liable to duty. The only dutiable goods which show an increase are—tea, £3,727; hops, £804: coffee, &c., £2,646. There is a very large decrease in tobacco.

Telegraphs.—Negotiations are being carried on between the Governments of Victoria and Tasmania regarding the submarine telegraph cable long lying useless in Bass's Straits, owing to breakages, and which neither Government would take upon themselves to repair. The Victorian Government has, however, lately proposed to bear half the expense if the Tasmanian Government will bear the other half.

Melbourne International Exhibition.—The arrangements for the International Exhibition are being carried on with great energy. The building is advancing with rapidity, and the applications for space still continue to flow in. The most disappointing feature in connection with this undertaking is the disinclination of New South Wales to join, but efforts are being made to induce the eldest of the colonies to co-operate with the others in securing an adequate representation of colonial products. Dr. Bleasdale and Mr. Knight, the Secretary, are now in Sydney, as a deputation from the Commissioners, to endeavour to induce the co-operation of the New South Wales Commission in both the International and Paris Exhibitions. Steps are being taken to secure at the Exhibition as complete a collection as possible of the art productions of the colonies. With regard to the Paris Exhibition, there is scarcely anything to report. It is expected the French steam frigate Sybille will convey the products of the Australian colonies to Paris.

Vine Cultivation in Australia.—There has been a great extension of vine growing in the Aldbury district, very largely brought about by some enterprising emigrants from Victoria, who, not finding the climate of Geelong altogether satisfactory for the purpose, crossed the border and found what they wanted near Aldbury. The soil, situation, and climate in that locality seem all highly favourable to the production of wine, and though the industry there is comparatively new, an excellent and highly promising wine has already been produced. The prospects of the trade has been somewhat overclouded of late by dissensions between this colony and Victoria with reference to the border customs. The two countries treat each other now as foreign countries, and tax each others produce. The great market for Aldbury wine used to be found south of the Murray, in the Ovens district, and in the townships thereabout. The duty imposed has practically arrested the exportation of the wine to that market, and as there is no adequate market north of the river the cellars are filled with unsaleable stock. The government has been frequently memorialised on the subject, but the general interest of the colony in collection of its border duties has overborc the interest of the Aldbury wine grower.

QUEENSLAND AND THE PARIS EXHIBITION.—The local exhibition of Queensland products to be forwarded to the International Exhibition at Melbourne and the Paris Exhibition, closed on the 30th ult. This colony will make a good show at the Exhibition at Paris, as most of the natural and other resources are represented.

EDUCATION IN NEW ZEALAND.—In his last report for last year the inspector of schools for Wellington gives the following statistics:—There are 30 districts, in five of which there are no schools; there are 1,083 names on the roll, and the average attendance was 724. The highest number on the roll for one district is for the Taita, 120, with a daily attendance of 90. The next is the Lower Hutt, with 100 on the roll, and a daily attendance of 90; the lowest is the Lower Rangatiku, having only nine on the roll, and a daily attendance of six. There are 34 teachers, whose salaries amount to £2,675, the lowest rate of pay being £60, and the highest £150. The inspector recommends a minimum number of householders and children should be fixed in establishing a new district.

PROGRESS OF NEW SOUTH WALES.—Between the years 1834 and 1864 the population has increased from 66,212 to 392,589, although in the meantime the flourishing provinces of Port Philip and Moreton Bay have been cut off and erected into separate colonies, under the respective names of Victoria and Queensland. The separation of these districts from New South Wales must also be borne in mind in considering the other figures now to be quoted. Thirty-two years ago these figures applied to the whole of Australia, but in 1851 Victoria was cut off, and in 1859 Queensland followed, South Australia having separated previously, yet it will be seen that, notwithstanding these vast deductions, and in spite of all other drawbacks, the progress of New South Wales has been highly encouraging. We have shown the increase of population, after giving to the separated colonies their due proportions of the 66,212 who inhabited the whole territory in the year 1834. In the same period of 30 years, and similarly omitting altogether the deductions caused by the separation of the flourishing colonies alluded to, the manufactories increased from 58 to 2,084; mills from 71 to 174; number of acres under crop, from 74,811 to 318,854; live stock, from a number which appears to have been apparently too insignificant to record, to ten millions and six hundred thousand, mostly consisting of sheep, horned cattle, and horses; coal raised from native mines, from 8,490 to 550,000 tons; shipping, tonnage inwards, from 58,532 to 607,168 tons; value of wool exported, from £213,628 to £1,628,493; gold exported, from simply nothing to £2,952,471 in the year 1864 alone, and the total exports of this colony during the same period of 30 years rose from £587,640 to £8,117,217, while the imports increased from £991,990 to 9,836,042. During the same period also the revenue increased from £205,443 to £1,693,792. These results, making no account whatever of population and wealth carried in the meantime to the credit of South Australia, Queensland, and Victoria, must show that the colony of New South Wales is sound, prosperous, and progressive.

Obituary.

DAVID RAMSAY HAY was born in Edinburgh, in March, 1798, and was, consequently, in his sixty-ninth year when he died, on the 10th of this present month of September. He began life as an apprentice to Mr. Bengo, a heraldic and ornamental house-painter, where he was a fellow-apprentice with the late David Roberts, R.A., with whom he maintained a friendship through life. Some pictures painted by Mr. Hay when quite a young man attracted the attention of Sir Walter Scott, who at once pointed out the direction in which he considered Hay's talent would be most useful; and under his advice he commenced business as a decorative house-painter, in which profession he for many years maintained a leading position. In 1828 Mr. Hay made his first essay as an author; and his first work, entitled "The Laws of Harmonious Colouring," at once obtained notice, and afterwards went through six editions. Mr. Hay afterwards published in succession the following works:—1. "The Harmonic Law of Nature applied to Architectural Design;" 2. "The Natural Principle of Beauty as Developed in the Human Figure;" 3. "The Orthographic Beauty of the Parthenon Referred to a Law of Nature;" 4. "First Principles of Symmetrical Beauty;" 5. "The Principle of Beauty in Colouring Systematised;" 6. "A Nomenclature of Colours Applicable to the Arts and Natural Sciences;" 7. "The Laws of Harmonious Colouring Adapted to Interior Decorations;" 8. "On the Science of those Proportions by which the Human Head and Countenance as Represented in Ancient Greek Art are Distinguished from those of Ordinary Nature;" 9. "The Geometrical Beauty of the Human Figure Defined;" 10. "An Essay on Ornamental Design, in which its True Principles are Developed and Elucidated;" 11. "Proportion, or the Geometrical Principle of Beauty Analysed; 12. "The Natural Principle and Analogy of the Harmony of Form;" and, 13, "The Science of Beauty." Mr. Hay's views "On the Beau-ideal Head of Ancient Greek Art," and "On the Geometric Principles of Beauty especially applied to Architecture and the Human Form,"* formed the subject of two papers and discussions before the Society of Arts some years since, and the older members of the Society will recollect the great change which Mr. Hay introduced into the Society's Great Room when, under his direction and at his expense, it was re-decorated. Mr. Hay took a leading part in all that concerned the welfare of his native city. He was one of the earliest to assist in fostering the Royal Scottish Academy, and some fifteen years ago he established an Æsthetic Club in Edinburgh, which included several men of distinction.

HENRY CHAWNER SHENTON, the historical line engraver, died suddenly on Saturday evening, the 15th instant, attacked with an apoplectic fit. He expired in less than half-an-hour afterwards. He was a pupil of Charles Warren, and one of the last of that series of eminent engravers of the pure line style, which may be said to begin with Sir Robert Strange. Continued by William Sharp, Charles Warren, James and Charles Heath, Richard Golding, Shenton, John Henry Robinson, Lumb Stocks, George T. Doo, and other eminent men, it has created the English school of this art, which takes a rank beside that of any other country. These observations apply to the engraving of figure subjects Line engraving as a distinct art, is in the present day, ceasing in England, and is being supplanted by styles more easily executed and more mechanical, but not more beautiful. Of the series of line engravers named above but very few remain, and as one by one drops off, the number is not recruited. The best of Shenton's larger works are probably those he did from Mulready's pictures; the most widely known are probably his later plates, engraved for the Art Union of London, the most notable of which was "The Death of Cœur de Lion," from John Cross's great picture in the C Committee Room of the House of Lords. Mr. Shenton was born in 1803, at Winchester, but his family originally settled at Barwell, County of Leicester. Latterly, owing to a failure in his sight, he was not able to practice his profession. He was a man of remarkable amiability, and devoted to his art.

---

* *Transactions*, 1847-8, p. 447, and 1851, p. 73.

Publications Issued.

SYMONS'S METEOROLOGICAL MAGAZINE.—*(Stanford.)*—No. VIII. of this magazine, which comes out monthly, made its appearance on the 1st of this month, under the editorship of W. J. Symons, so well known as an indefatigable observer of meteorological phenomenon, and more especially of the rainfall. The present number contains articles on "The Meteorological Departments of the Board of Trade," "Floods in the North Riding of Yorkshire," a Table of the "Rainfall in August," and "Notes on the Month."

Notes.

ROYAL CORNWALL POLYTECHNIC SOCIETY, 34TH ANNUAL EXHIBITION.—As the notice of this exhibition in a former *Journal* was printed before the opening of the exhibition, no full account could be given of all the objects of interest. In the mechanical department Blake's ore crushing machine was shown at work, and excited a good deal of interest. On Monday the capabilities of Messrs. Griffin and Sons' oil-lamp furnace were tested before the public. It was shown that brass and cast iron, in comparatively large quantities, could readily and quickly be melted by it. The portability and cheapness of the furnace constitute its great merit, and the furnace would doubtless be of use for assaying ores where an ordinary wind furnace was not at hand. Two transverse Sections across mining districts, showing the lodes, dykes of porphyry and greenstone, and the relations of the "killas" to the granite, attracted the attention of miners and geologists; and it is to be hoped that the prizes awarded to these very excellent sections will be the means of encouraging further efforts in this direction by the mine agents of the country. Mr. John Hunt's patent ore separator was shown in operation just outside the building, and was generally approved of. The most prominent pictures in the fine arts department are the "Eurydice" and "Fate of Icarus," by Thompson, and the portrait of Captain John Richards, by Mr. Sydney Hodges. This, and his portrait of the Bishop of Exeter, are considered remarkably good. Mr. J. Bell has kindly lent a series of small paintings by C. Landseer, R.A., which were extremely interesting. The picture, "Pear and Grapes, with the bluebottle and humble bee," by H. A. Major, was noted as being very true to nature; and there were numerous works by A. Montague and others equally deserving of attention. The show of water colour drawings was by no means despicable, and there were some capital examples of Cornish coast scenery, by T. Hart and R. H. Carter. The amateur productions were far from being so numerous as those of their professional brethren, the latter being about 160 in number, the former only 75. In the department of drawings, maps, and penmanship (school productions) the "Lander" prize of £2 was awarded to C. B. Henderson, for a very carefully executed map of Australia, accompanied by a description of the country. The other prizes were numerous, and will undoubtedly act as a stimulus to future efforts. The collection of photographs is not so large as might be expected in a country which offers such an abundant variety of rock scenery. It is true that the photographer cannot, like the artist, reproduce those glorious tints for which some of the Cornish coast is so famous, still rock scenery has this advantage over ordinary landscapes, that it does not require such perfectly still weather for a successful picture. By far the greater part of the photographs were by persons not resident in the country. Some views of Switzerland, Normandy, and Belgium, by Stephen Thompson, of London, were charmingly executed, and the photography of Cornish scenery, by May and Devonport, and H. Hayman, of Launceston, as well as the contribution of F. Bedford, were much admired. The duplex medallions by W. Gillard, of London, were new to the county. The natural history department included collections of bird's eggs, birds, shells, butterflies, moths, and minerals. The large and carefully-arranged collection of Mr. Thomas B. Provis, a young working miner, was particularly good, and fully deserved the prize of £5 (or a 1st bronze medal) which was awarded to it. The plain and fancy work was no doubt interesting to the female portion of the visitors, but as no large prizes were awarded, it must be inferred that the judges saw nothing very novel or of extraordinary merit. A number of models were exhibited in the naval architecture department, and were of course closely criticized in a seaport town. Mr. Husband's model of a ship's mast, provided with an India-rubber cushion at the step under the heel of the mast, and a ring of the same material at the deck partners, giving great elasticity, and preventing sudden jerks or strains on the rigging, especially where wire rigging is used. Mr. Mulley's improved method for sheathing ships with wood prior to placing metal on the bottom were considered of the highest importance. Mr. Young's feathering screw propeller excited much interest, and was considered by the judges as a valuable invention. The other departments, though not largely represented, contained nevertheless many objects worthy of a careful examination. The exhibition was opened during the day and also in the evening, when lectures were given. On Friday the Rev. Mr. Scrivener gave a lecture on "Modern Literature;" and on Monday Mr. Vivian, of Torquay, chose "Prehistoric Man" as his subject. Professor Tennant lectured on Wednesday, and the exhibition closed on Friday, 21st inst.

EXHIBITION OF FRUIT, VEGETABLES, AND FLOWERS IN PARIS.—The Imperial and Central Society of Horticulture of France will hold an exhibition of fruits, flowers, and vegetables at their rooms, No. 84, Rue de Grenelle-Saint-Germain, from the 29th September to the 3rd October, in which both French and foreign horticulturists and amateurs are invited to take part. Besides the Society's usual gold, silver gilt, silver, and bronze medals, there will be awarded at this exhibition two large gold medals, given by their Majesties the Emperor and Empress; two silver gilt medals, given by her Imperial Highness the Princess Mathilde; four large gold medals, given by the Minister of Agriculture and Commerce, and by the Prefect of the Seine, in the name of the City of Paris and the department of the Seine; two gold medals, given in the name of the lady patronesses of the Society; a gold medal, by the Marshall Vaillant, the president of the society; and, lastly, a gold medal presented by one of the lady patronesses, the Countess Turenne, intended especially for the introduction of some new plant into France. Judging by previous autumn shows of this Society, the exhibition for the end of this month cannot fail to be attractive and brilliant.

SAIGON EXHIBITION (ASSAM).—His Excellency the Minister of Marine and Colonies has just informed the Chamber of Commerce of Paris, that his department undertakes to forward to their destination the specimens that shall be sent by the metropolitan trade to the Industrial and Agricultural Exhibition at Saïgon. Manufacturers who intend exhibiting can, from this date send their productions to the Maritime Prefect at Toulon, who has received orders to forward them to Saïgon (*viâ* Suez) by the government ships. Goods of this nature will be received by the maritime authorities until the end of the month of November next, and should be accompanied by a descriptive letter, a copy of which must be sent to the Department of Marine and Colonies. After the closing of the Cochin China Exhibition, the goods that cannot be sold at Saïgon will be sent back to Toulon by the Colonial Administration, at the disposal of the proprietors.

MARITIME INTERNATIONAL EXHIBITION AT HAVRE.—An International Maritime Exhibition is being organised at Havre, by the Société de l'Exposition, and under the patronage of the town of Havre. It is to be opened the 1st January, 1868, and to be closed the 30th September. The Maritime International Exhibition of Havre will be a complete and grand display of the universal progress and improvement in navigation, both by steam and sailing vessels; at the same time it will show the resources of international commerce, its importance, and magnitude. It will take up in this special and vast province the fertile idea of the Exhibition of Paris, of which it will form a brilliant maritime continuation. Agriculture and fishing will also be comprised. The programme of this exhibition will contain ten classes, besides a supplementary one, relating to experiments and practical trials with regattas, which will take place during the whole time the exhibition is open, and will materially add to its interest and brilliancey.

STOCKHOLM EXHIBITION.—An industrial exhibition has for some time past been opened at Stockholm. This exhibition, which contains the products of Sweden, Norway, Denmark, and Finland, is very interesting. The iron, steel, glass, porcelain, woollen fabrics, cabinet work, jewellery, and goldsmiths' work, show the perfection that they have attained in these countries. Those of manufacturers and others interested in these matters who have not visited it, may still avail themselves of the last few days that it will remain open. The exhibition will be closed the 1st of October next. The journey from Paris to Stockholm, *viâ* Berlin, occupying sixty-three hours, there is still time to visit these rich galleries, and to examine any objects of interest.

RECLAMATION OF THE ZUYDER ZEE.—A gigantic undertaking is at the present time spoken of, for which preparatory works have already been executed. It is nothing less than the reclamation of the Zuyder Zee, on an area of 195,000 hectares, or 485,550 acres. The cost is estimated at 106 millions of florins, or £8,480,000 sterling.

COPPER MINES IN CALIFORNIA.—The working of copper mines in California has now attained such a development that it promises even to surpass, in importance, those of mercury, and justifies the prediction that it will one day become the largest copper-producing country in the whole world. The Californian copper mines are rich and numerous. Ores containing two per cent. can be profitably smelted, it is believed, at Swansea. The Californian mines give easily 10 per cent., and have already produced thousands of tons of ore giving 20 per cent. Enormous profits might be realised if the price of transport to San Francisco from the mines of Tulare, of Siskiyon, of Plumas, and of St. Bernardino, permitted the exportation of the ore. Fifteen counties, from San Diego to Del Norte, possess veins of copper will give at least 10 per cent., but while the means which of transport remains so costly only the mines nearest to San Francisco can be profitable at the present time. Amongst these the Union Mine, at Copperopolis, exported 110 tons of ore per day, of which 50 tons contained 20 per cent. of metal; but a very large portion of this is absorbed in the cost of carriage of the ore to San Francisco. To obviate this cost attempts have been made for some time past to smelt the ore on the spot. The German system of smelting is generally employed in California. By this means cakes containing from 90 to 95 per cent. of copper are obtained. It will soon be found as common as bars of gold or silver in the market of San Francisco. The ores found at present are carbonates or oxides.

Patents.

From Commissioners of Patents' Journal, September 21st.

GRANTS OF PROVISIONAL PROTECTION.

Articles, making, &c.—1898—E. Tomlinson.
Boots and shoes, fixing the soles and heels of—2260—E. Lamb and S. Middleton.
Boots, shoes, and knives, cleaning—2284—R. S. M. Vaughan.
Buildings, ceilings of—2281—C. Cetti.
Clod-crushers, &c.—2268—W. C. Cambridge.
Elastic fabrics—1870—J. Macintosh and W. Boggett.
Electric clocks—2285—A. V. Newton.
Fibres and fabrics, bleaching—2266—C. E. Brooman.
Fibrous materials, spinning—2275—G. Lowry.
Fibrous substances, preparing, &c.—2289—P. Smith.
Field artillery, carriages for—2265—J. C. Haddan.
Fire-arms—2267—E. Russ, H. and E. Hammond.
Fire-arms, breech-loading—2272—C. Reeves.
Fire-arms, breech-loading—2279—J. Leetch.
Fire-arms, breech-loading, and in cartridges and projectiles—2293—G. V. Fosbery.
Fire-arms, repeating—2224—E. T. Hughes.
Gas, regulating the supply of—2277—W. T. Sugg.
Gun and pistol locks—2287—W. P. Bardell and W. Powell.
Hoop-skirts—2264—H. A. Bonneville.
Horses, feeding—2262—H. A. Bonneville.
Iodine and bromine from kelp, extracting—2273—A. Paraf and J. A. Wanklyn.
Iron ships, sheathing—2283—H. Robins.
Lights and shades, reflecting—2210—W. Gould.
Melting furnaces—2278—T. G. Webb.
Metallic substances, boring, &c.—2247—W. E. Newton.
Mowing machines—2274—J. B. Brown.
Needle-cases—2251—E. V. Billiotte.
Ovens—2291—G. Pimm.
Pavements—2240—J. H. Johnson.
Pianofortes—2276—E. Farr and I. Gregory.
Pipe-joints—2244—C. D. Abel.
Railway carriages in motion, signalling alarms from—2282—H. Knox.
Reaping machines—2254—J. Baker.
Safes—2256—A. W. Hosking.
Seeds, hulling and cleaning—2242—W. E. Newton.
Smoke-consuming fire-places—2263—H. A. Bonneville.
Solder—2252—A. Lebaudy.
Stone, working—2238—T. Gall.
Street gas lamps—2280—J. Wilson.
Sugar, making—2255—S. Vickess.
Textile fabrics—2249—J. O. Greenwood.
Vegetable fibres, bleaching, &c.—2236—J. M. Mellor.
Weaving, looms for—2246—J. Owens.
Weaving, looms for—2258—M. Knowles.
Weighing machines—2253—P. F. Michaud.
Winches, crank for—2234—D. Calnon.
Writing and drawing, teaching—2257—R. Frost.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Fire-arms and ordnance, projectiles for—2393—W. R. Lake.
Hat bodies, felting or sizing—2389—G. T. Bousfield.
Steam jets—2388—G. T. Bousfield.

From Commissioners of Patents' Journal, September 25th.

PATENTS SEALED.

859. C. E. Brooman.
877. T. Johnston and T. W. Rennie.
890. S. H. Salom.
894. F. P. Warren.
910. H. A. Bonneville.
914. G. T. Bousfield.
915. J. C. Martin.
920. W. Wray.
932. S. M. Martin, and S. A. and F. H. Varley.
992. J. Young.
2020. W. Smith.
889. J. Rawsthorne and E. H. Bayley.
897. J. Higgin.
898. C. T. Liernur.
901. W. Deakin & J. B. Johnson.
902. J. Gamgee.
905. T. Ryder.
913. E. Kochs, T. Reuter, and O. Henrici.
926. E. T. Hughes.
927. R. Hineson.
931. W. Read.
936. W. Hill and T. Whitehead.
984. J. and W. McNaught, jun.
1051. V. S. Fombuena.
1129. A. V. Newton.
1149. C. D. Abel.
1772. W. McAllum.
1932. H. Calisher.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2336. C. Maitland.
2371. J. Spence.
2407. W. E. Newton.
2329. C. T. Burgess.
2330. H. Hutchinson.
2331. T. B. Daft.
2334. G. M. de Bayelt and J. E. Vigoulete.
2345. W. Gibb and J. Holland.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2142. A. Lamb.
2202. C. Stevens.
2158. E. Jones.
2188. P. J. L. Chaumont.